

## Chapter Challenge

2-4 min <sup>5pts</sup> < 1:50 0pts > 5:00 3pts

Sound + Light equal mix

→ Entertaining (1-5 best)

Sound - Voices or self-built instruments

Light - conventional lamps  $\geq 2$  (prerecorded)  
5 per pair

Physics principles explained

2pts each

Creativity

Should have 3-6

$$5 + 3 + 8 + 10 = 26$$

## Section 1 Sounds in Vibrating Strings

8/22

### WDYS

different sounds

· pace, volumes might be different.

String w/ can, dog playing guitar  
strummed by  
girl frightened boy

### WDYT

Guitarist and violinist make different  
sounds by holding the strings down, based on the  
pitch they want they move their fingers forward and backwards.  
away + towards them

Skinniest string  
farther away from the player

Read Physics Talk + answer  
Checking Up #1-4 p. 487

8/23

WDYTN? p. 489



Physics to Go pp. 490-491 #3, 4, 6, 7, 8

8/24

WDYS

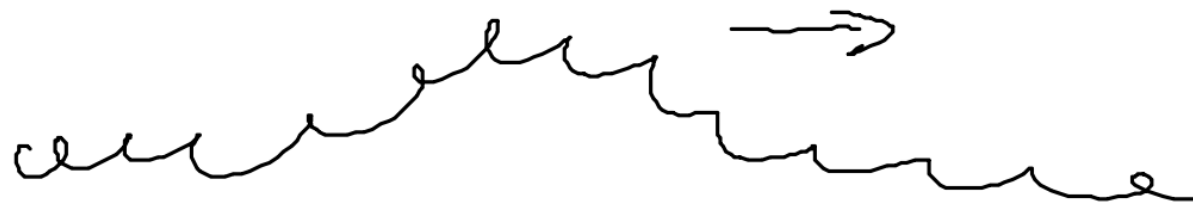
Girl surfing on a wire wave (Slinky)  
attached to pole on one end  
boy waving other end  
people surfing water waves  
surfing highest part of wave

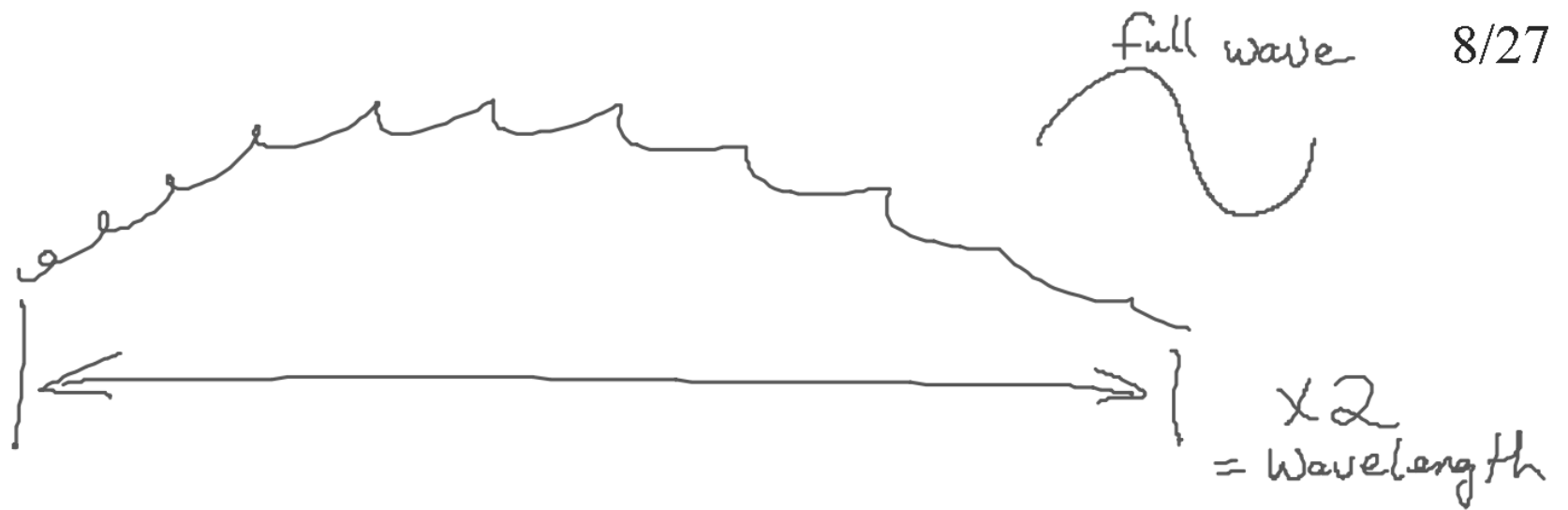
WDYT

moves back and forth   
up and down   
towards shore



9.935 m





8/29 15 min. to finish Part C p. 497

$$v = \frac{d}{t} = \underline{9.93 \text{ m}}$$

How do waves  
transfer energy?

- transfers energy with no transfer of mass
- energy is supplied to the medium
- energy moves away from the source
- no loss of energy (conserved)
- energy combined as waves pass each other

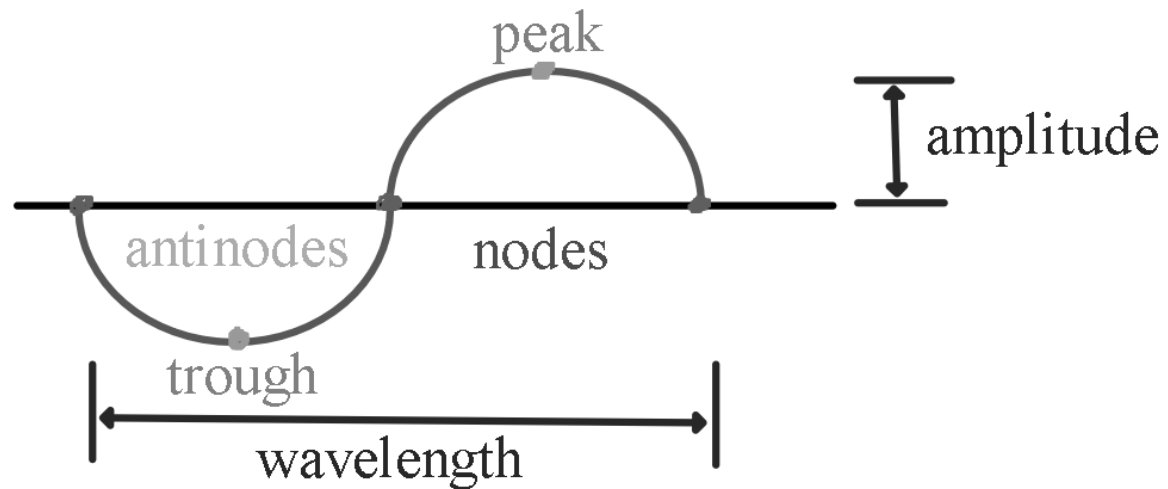
Vocabulary word

definition

p. 502 Checking Up #1-3

p. 504 WDYTN

pp. 505-507 #1-6, 10-14





WDYS

woman playing harp

boy playing homemade string instrument

picture of a standing wave w/guy sleeping

standing waves playbill

instruments have standing waves on strings

WDYT

why does string tension change the pitch?

wavelength changes

amplitude

frequency?

## Physics Talk

### Wave Speed, Wavelength, and Frequency

How are frequency and wavelength related?

- The lowest frequency's wavelength is double the string length
- Higher pitch = higher frequency
- $v = f \lambda$   $\left(\frac{m}{s}\right) = Hz \cdot m$   
 $\left(\frac{1}{s}\right)$
- $f = \frac{v}{\lambda}$   $Hz = \frac{\left(\frac{m}{s}\right)}{m}$
- shorter wavelength = higher/increased frequency
- inverse relationship

9/1

How do tension and thickness of a string affect frequency?

- $f = \frac{v}{\lambda}$
- increased tension = increased speed
- tension  $\uparrow$ , force  $\uparrow$ , acceleration  $\uparrow$
- $v \uparrow$ ,  $f \uparrow$  direct relationship
- thicker string, smaller acceleration, lower velocity, lower frequency

Is there an equation?

$$f = \frac{v}{\lambda} \quad v = f\lambda$$

Checking up p. 514 #1-3

WDYTN p. 515

Physics to Go p. 517 #1, 2, 3, 5, 7

WDYS

Blowing into pipes and bottles

Not much or poor sound coming out of pipe  
- no others indicate sound

Cat flees room

discarded tested instruments

plant (relaxing)

people sweating

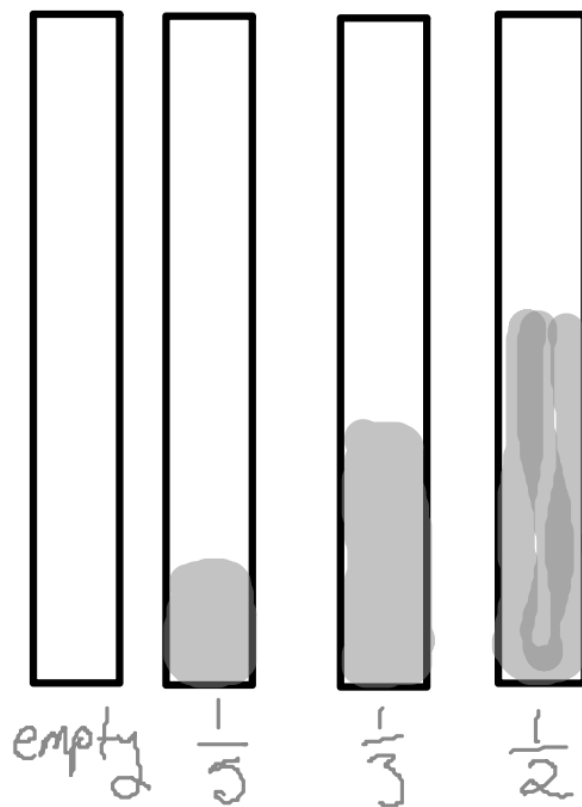
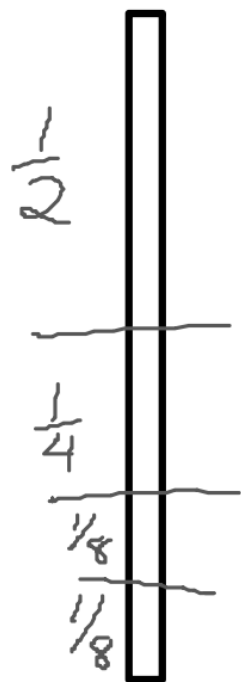
water coming from pipe

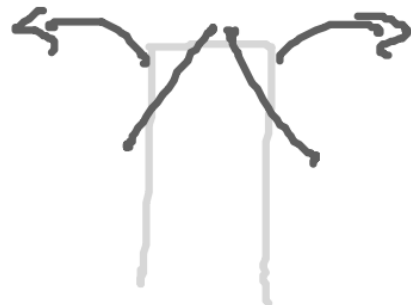
WDYT

air moves through them

all of the sound comes out at one time  
(amplified)

Vibrating air - against tube sides

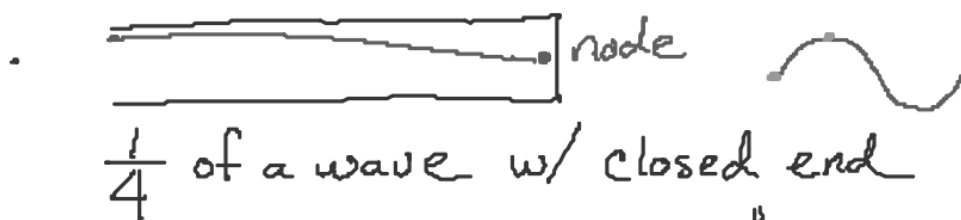




## Physics Talk Properties of Sound Waves 9/6

How does compressing air make sound?

- molecules of air squeeze together and spread out
- Coiled spring - longitudinal wave

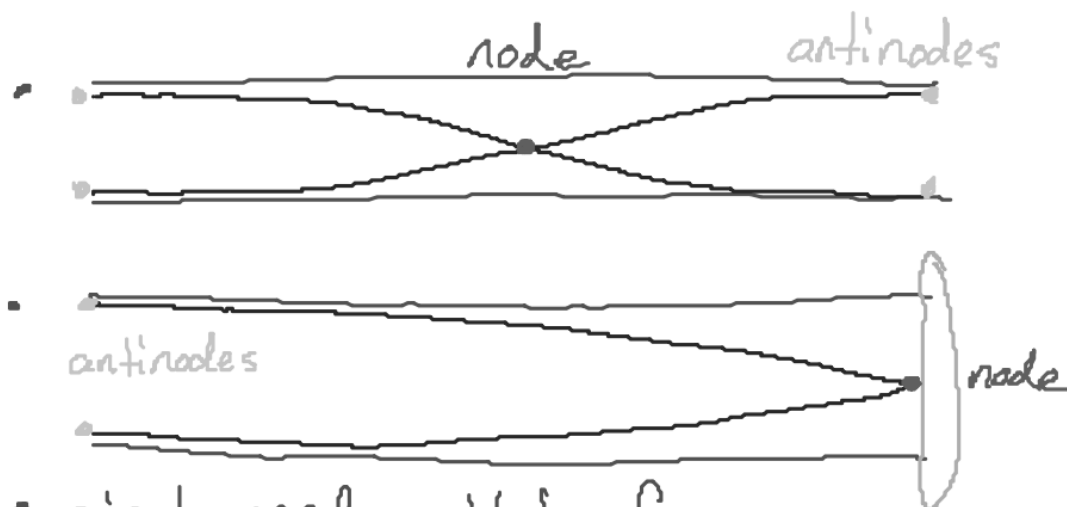


- Sound comes from an opening, spreads out and changes direction
- Smaller openings cause more diffraction

What is wave diffraction?

What about  
Vibrating columns  
of air?

- both ends open 9/7
- air molecules at both ends move back and forth



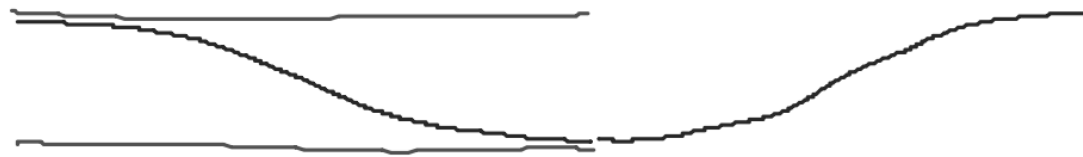
- air trapped, pitch + frequency decreased
- $v = f\lambda$   $f \downarrow \lambda \uparrow$   $f \uparrow \lambda \downarrow$
- open  $\frac{1}{2}\lambda$  fits in the straw  
 $\lambda = 2L$
- Closed  $\frac{1}{4}\lambda$  fits in straw,  $\lambda = 4L$
- $f_{\text{open}} = 2 \times f_{\text{closed}}$



p. 523 Checking up #1-3

p. 524 WDYTU

pp. 526-527 Plt # 1, 2, 3, 4, 8



Smarty Pants

Cynthia

Aneya

Jennifer

Sabrina

Sandra

Spicy Habañeros

Breanna

Jessica

Melissa

Obsession

WDYS

Cat w/ big lamp + small shadow

Mouse w/ small lamp + big shadow

Shadow size depends on how close you are to a lamp

Mouse's shadow is fuzzy, cat's is not

Mouse's shadow looks like it is intimidating the cat

WDYT

The movement of the sun (light source)

Cloudy - shorter shadow

Sunny (clear skies) - longer shadow

Closer the sun to the horizon, the longer and sharper the shadow

less sun - sharper shadow

more sun - fuzzier shadow

Observed — the farther the light is from the object,  
the crisper the shadow and the smaller the  
shadow

Smaller light source — bigger shadow  
the brighter the light, the crisper the shadow

Light rays travel straight

## Physics Talk

Does light travel in a straight line?

How can a shadow change length?

What is an umbra and a penumbra?

- Light rays travel in a straight line
- Closer light source is to an object, the bigger the shadow
- as the position of the light source changes, the length of the shadow changes
- Umbra - part of the shadow that gets no light
- penumbra - part of the shadow that gets partial light
- the bigger the penumbra, the fuzzier it looks

WDYS

A young, happy, man lying on his bed which is on the floor. The dog, also on the bed, is howling at the reflection of the moon. The reflection is reversed. The top of the mirror is tilted away from the boy so he can see out the window above his head.

WDYT

I BELIEVE THERE IS A FOIL LIKE MATERIAL IN THE BACK OF THE MIRROR TO MAKE A REFLECTION. There must be light, and we must be straight in front.

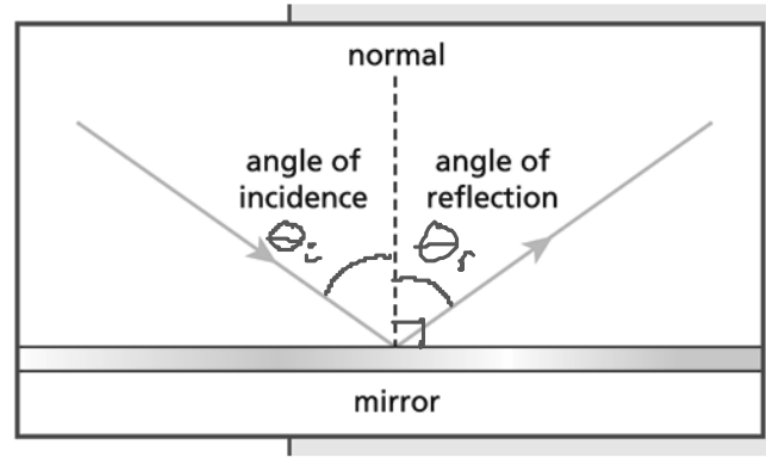
To see more of yourself in a mirror you must get a bigger mirror. Step straight back or

SEAH OIMMICHAEL

How do you locate  
an image in a plane mirror?

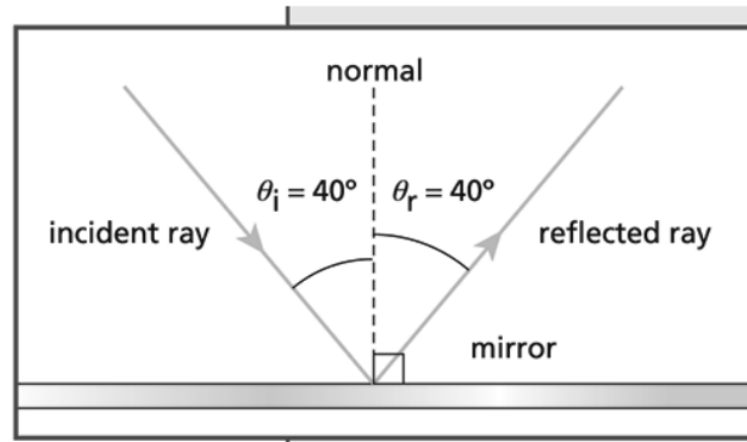
- incidence — the ray that hits the mirror
- reflected — the ray that bounces off (reflects) a mirror
- angle of incidence is equal to the angle of reflection



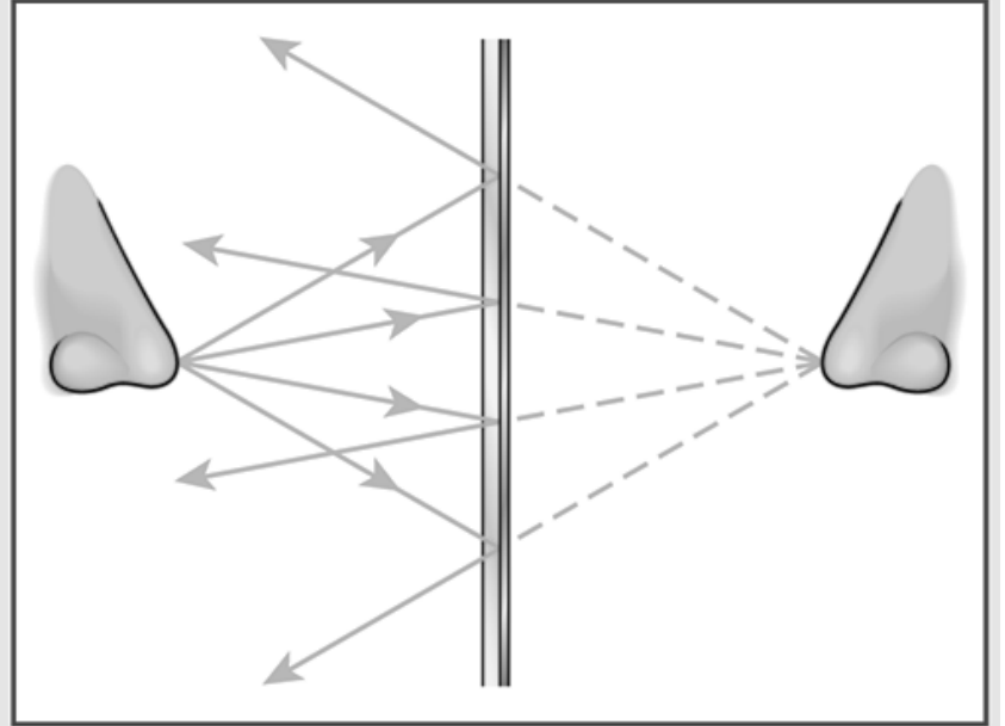


$\theta_i$ : the measure of the angle of incidence


$\theta$  theta, the measure of an angle



Trace back through the mirror plane the reflected rays to locate the image of the object



What are light waves?

- Light waves have properties similar to sound waves
- transverse waves 
- do not need a medium
- Vacuum - an empty space
- transfer energy

P. 543 Checking Up 1-3

P. 544 WDYTV

Pp. 546-7 Pt 6 1-4, 7, 8

WDYS

Three different mirrors : different images as you look into them.

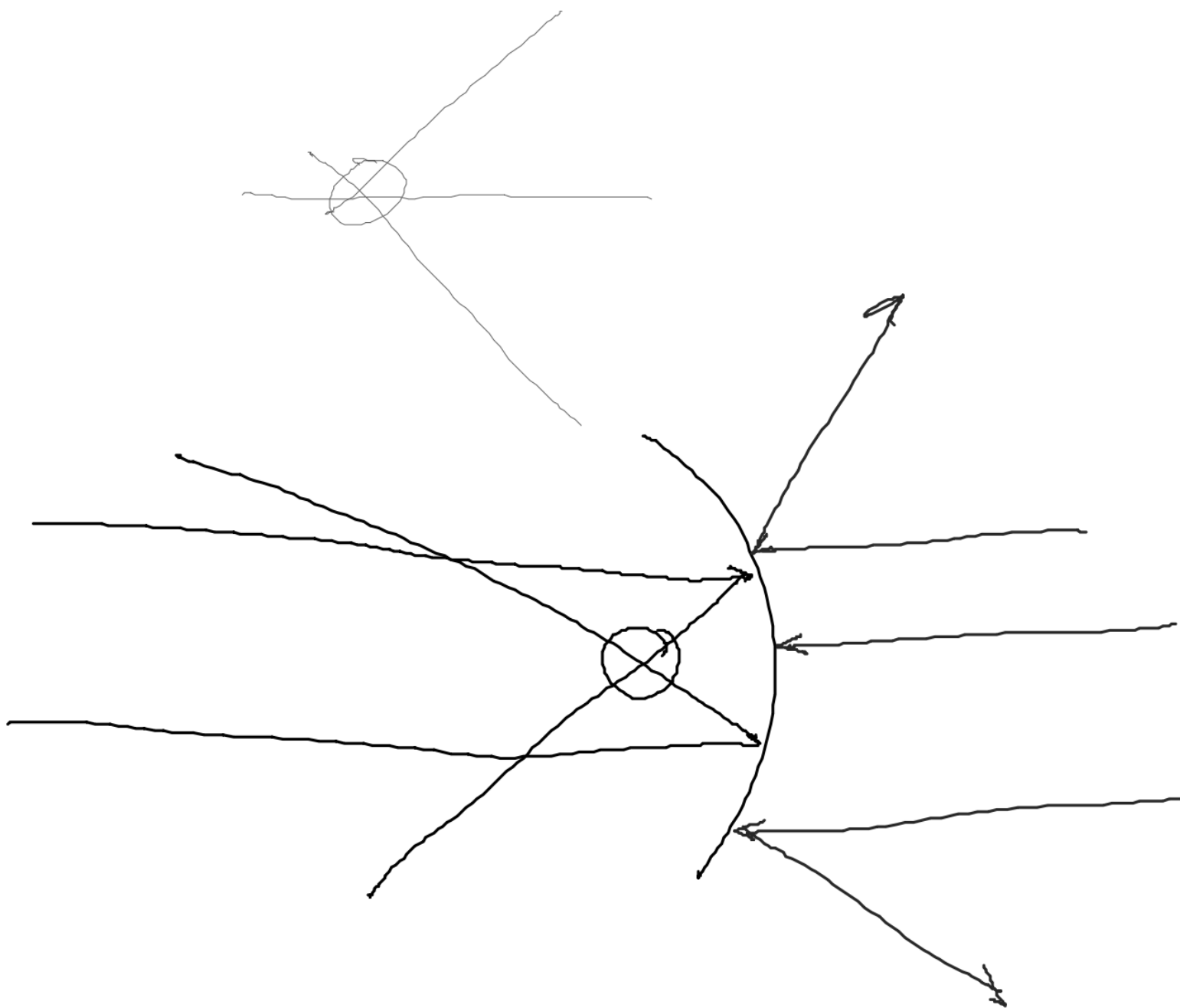
1. skinny guy looks fat : Short.
2. wide : Short, looks skinny : Tall
3. Little, looks big : wavy.

Different looks because of the curves in the mirror.



WDYT

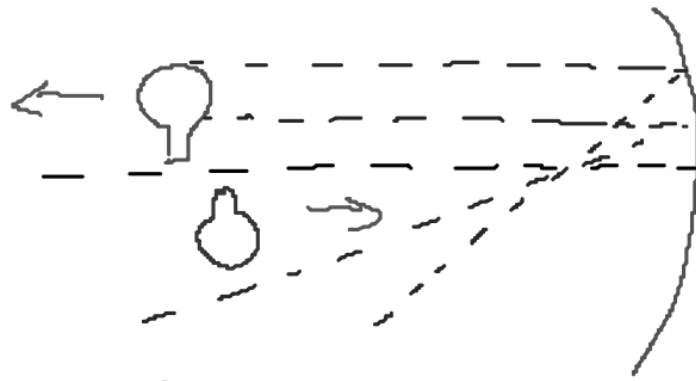
Curved mirror makes the object look distorted and closer, or further. Reflected Rays are distorted too.



## Physics Talk

How to make real images with curved mirrors.

- Concave - real images
- Convex - Virtual images
- Real image - an image that will project on a screen or on a camera's film (sensor)
- Virtual image - Cannot be projected on a screen or camera, light appears to come from beyond the mirror
- angle of incidence equals the angle of reflection



- When the object moves away from the mirror, the image is smaller and closer to the focal point
- Virtual image - appears to be on the opposite side of the mirror, the rays diverge from the focal point, image can be larger than the object
- image can be smaller than object

p. 552 Checking Up #1-3

p. 554 WDTN

pp. 555-7 Pt 6 #1, 2, 3, 5, 6, 10, 11, 13

Center of curvature ←

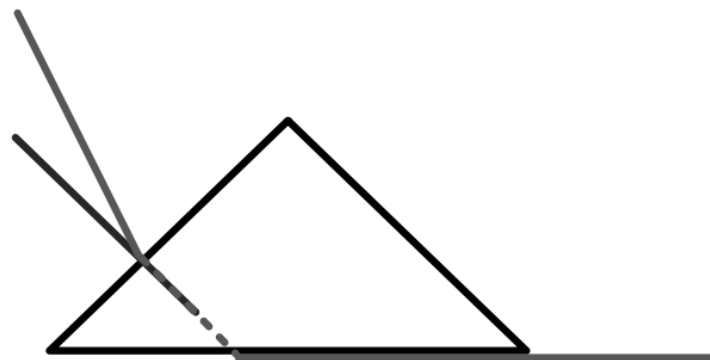
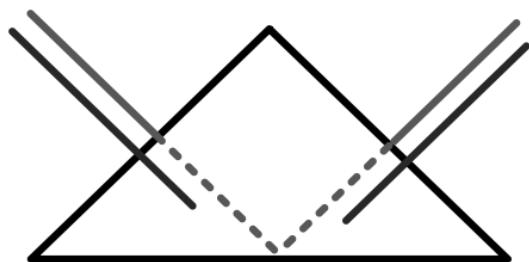
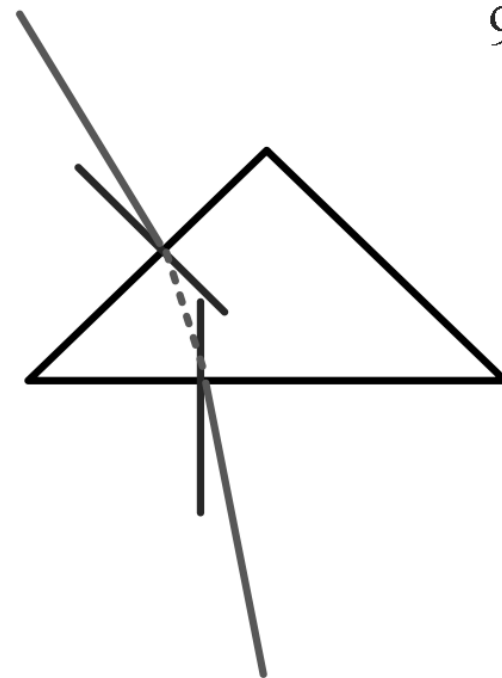
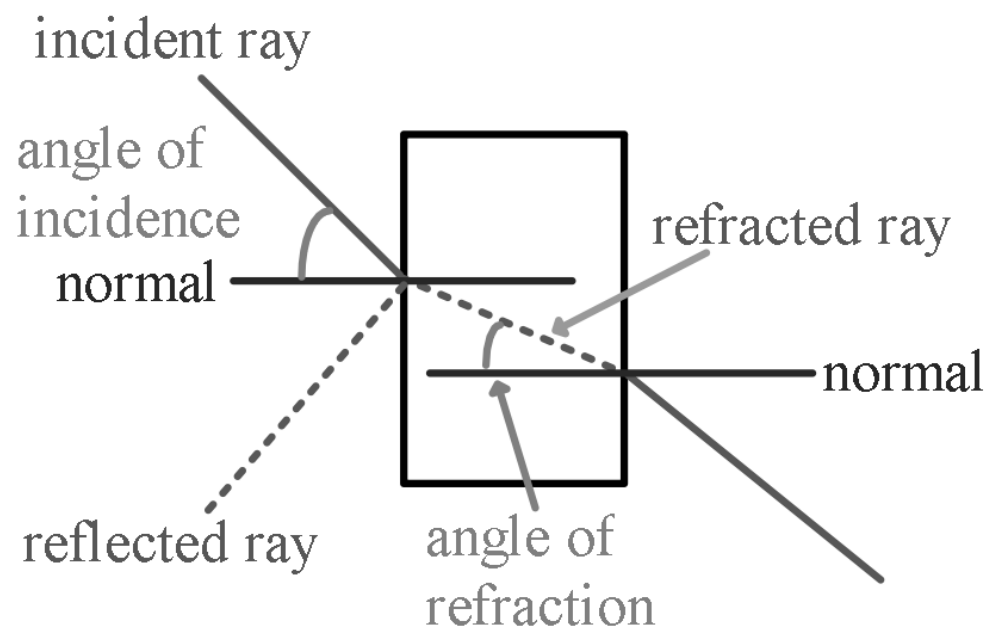


WDYS

boy looking at a fish that is behind a rock  
because of the refraction of light by water  
Cat's looking at fish w/ peripheral vision

WDYT

Use light, jeweler's loupe (magnify)  
light reflects off of cut glass, but goes  
through a diamond  
diamonds shine more than glass  
non-diamonds show different colors

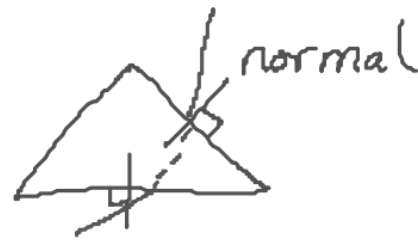


## Physics Talk

What is the law of refraction (Snell's Law)?

- refraction occurs when light goes from one material to another
- index of refraction - a specific property of transparent material
- diamond - can be distinguished from glass because it bends light more than glass
- diamond - high index of refr.
- some materials have similar properties: light bends a little
- Snell's law compares the index of refraction with the ratio of the angle of incidence compared to the angle of refraction

- When light goes from a low index to a higher index it bends towards the normal



- When light goes from a high index to a lower index it bends away from the normal
- Critical angle - the angle of refraction is  $90^\circ$  for that angle of incidence
- angles greater than the critical angle cause the light to reflect back into the substance

- Total internal reflection - the light stays inside the medium
- Index of refraction is related to the speed of light in a vacuum  

$$c = 2.99 \times 10^8 \frac{m}{s}$$
- index of refraction =  $\frac{c}{\text{speed of light in the material}}$

p. 562 Checking Up #1-3  
 p. 563 WDYSN, WDTN  
 p. 565 PEG #1-6

## 5.9 Effect of Lenses on Light

p. 567

9/29

WDYS

magnify for viewing  
reducing for recording

WDYT

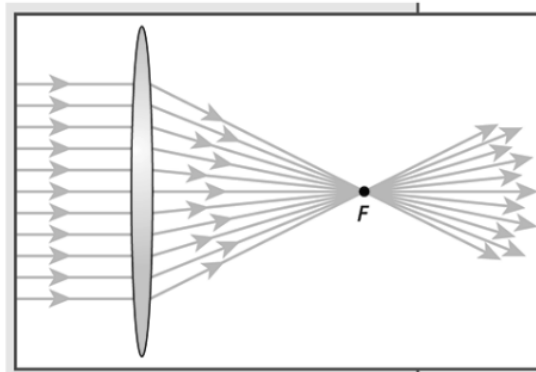
transfer molecules through the light  
via the lens on to film

9/30 Skip Investigate step 9.

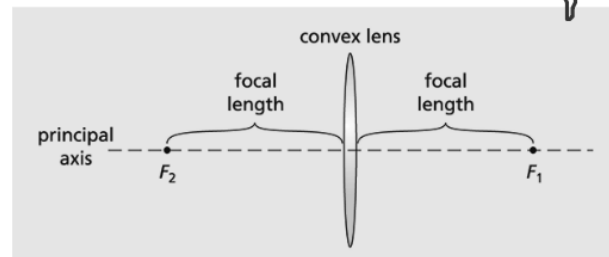
## Physics Talk

How do convex lenses form images?

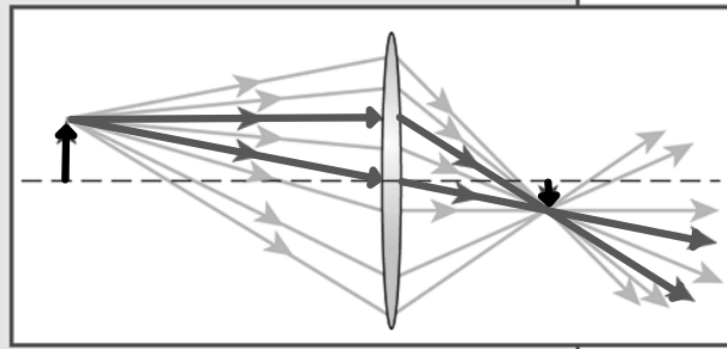
- thicker in middle + thin on edges
- light rays refract twice when passing through the lens
- parallel light rays converge at one focal point



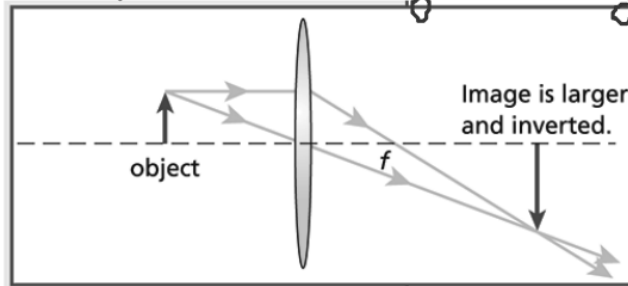
- Second focal point on other side



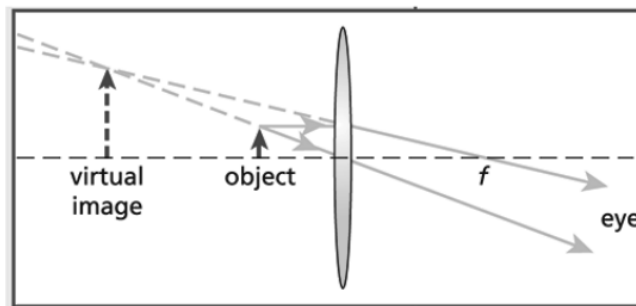
- produce real images



- film is near focal point of the lens to make a larger image

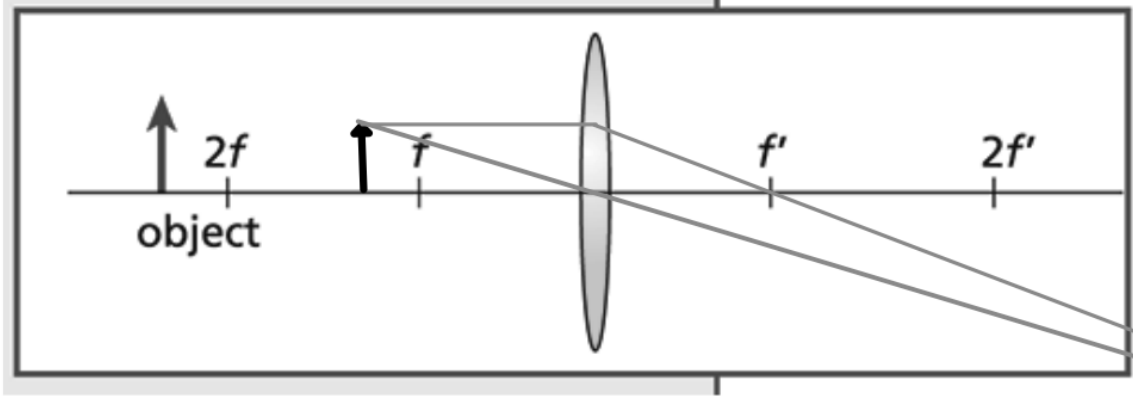
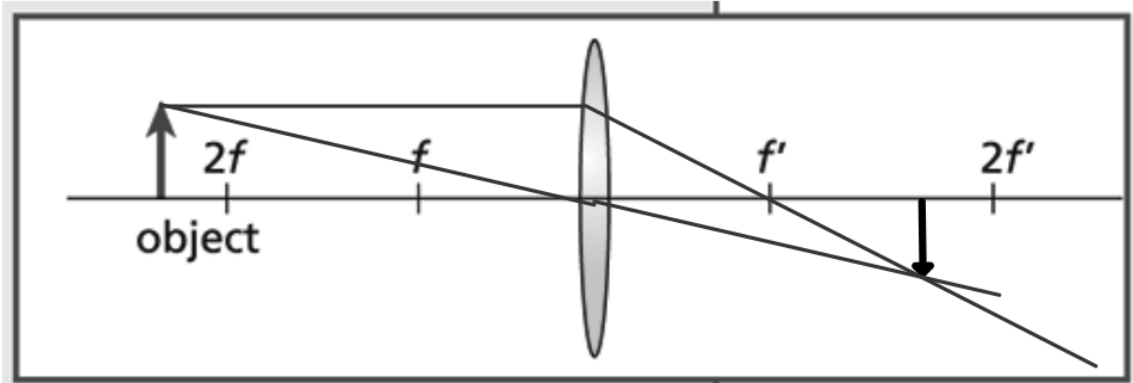


- Camera works like projector in reverse
- object closer to lens than the focal length, no real image



magnifying glass





p. 571 Checking up # 1-3

p. 573 WDAYTV

p. 574-5 PEG # 1, 2, 3, 5, 7, 13

## WDYS

1 See a girl throwing a ball in front of 3 colored lights, red green & blue & on the projection there is 3 shadows of her, blue red & yellow

the lights mix to create the new colors  
rainbow + cat w/ flag of France

## WDYT

Paint vs. light

Light rays, Light is brighter, reflections

Light moves & paint stays put

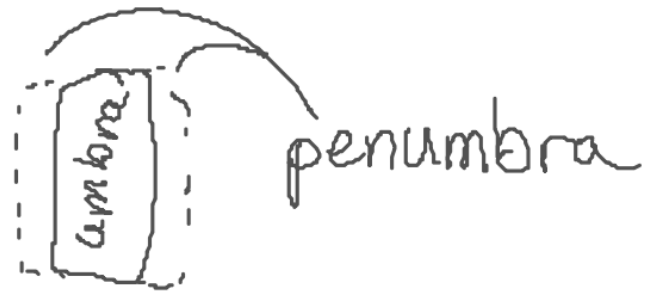
Red flashlight + green flash light = yellow

## Physics Talk

What happens when you mix different colored lights and paints?

- Color reflected is what you see
- all other colors absorbed
- mixing lights = additive
- red + green + blue = white
- white - combination of all colors of light

• Shadow



- mix paints - subtractive
- red + green = brown  
most color is absorbed